RESEARCH ARTICLE

Developing Innovation Process for Research Organisations

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ABSTRACT: The determinant of an innovation led organization is by and large conspicuous by its climate of implementation. An organization like Fraunhofer Society in Germany with over 25,000 full time scientists and with an overall budget of 2.2 Billion Euros still places its main emphasis in structural freedom and the freedom of implementation to its skilled workforce. Innovation in a technology or process incorporates the developer's awareness, selection &adoption techniques, mainly during the implementation phase the whole team increases its skills. It is the freedom of implementation that successful organizations prioritize than the main research or methodology emphasis, allocation of resources and project management. The essential guiding principles that lead to strategic planning for an innovation context are individual motivation, superior motivation and coordination. The Fraunhofer society focuses mainly on research impact in "Business" relevant thematic and businesses are directly linked to Innovation. In this article, the author will focus on the details of the innovation in a department focussing on holistic technology process with-in Fraunhofer that was developed for a new market. The author will additionally highlight the associated innovation development process required for the project. In the assumption of the organization being a world leader in innovation and its reputation being outstanding, the author will list the main obstacles and resistance faced in the innovation journey.

KEYWORDS: Innovation, Strategic Leadership, Applied Research, Technology Innovation, Management, Strategy, Internationalization, IPR,

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1. INTRODUCTION

Innovative organisations have a distinct advantage compared to traditional organisations. In the context of a research organisation, innovative approaches can maximise the impact of research in terms of business relevance and academic progression. The impact of research is often measured with the publications and the patents the organisations develop. However, governance structure and leadership often plays a significant role in creating an innovative culture. In this paper, the author is showcasing a highly innovative institution with over 70 years of culture in providing consistent impact to science and technology based innovation. Whilst, the article showcases the how can innovative patterns be developed, it also highlights the barriers of innovation caused mainly by strategic misalignment of leadership and the ambiguity of decision making.

Innovation in Process/Product Development

Product, technology, or process development as a whole is divergent to its system of creation [1]. The technological advances in an ever changing business environment foster the need to innovate [2]. The steps of innovation from strategy to executions are determined after recognising of the needs of the end-user [3]. On the path to innovation, three main divisions of a process within any new product are identified:

Technology/Process Deployment Strategy for a new or an existing market

- How to reach the objectives with available budget and resources?
- Measures for dissemination (Impact oriented or project delivery oriented)
- Risks evaluation on a very early stage of the product (Risk include commercial, economic, cultural and even social risks when entering a new market

Commercialization strategy for the specific product

- Is commercialization possible or is the product only a simulation success?
- Are public organizations (in this case Fraunhofer being a public organization) well-suited for commercialization? (As commercialization of product invites customer service and IP protection where Universities and research organizations are not well-equipped)
- Potential benefits from commercialization and associated costs

IPR regulation on the context of technology development

- Ownership of IPR
- Management of IPR

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An organization building its innovation to its existing business model or strategy can realize its full potential and such organizations normally collaborate with external partners [4]. Successful projects at Fraunhofer have exhibited a great level of external partnership or collaboration and generating ideas only with internal staff was never recommended. The provision of business or market share to partners who contribute within the project raises competitiveness and leverages better sustainable advantages beyond the project [5]. The trend of successful projects highlights another specific characteristic of non-urgent tactics to entering a new market [6]. Some of the failed projects at Fraunhofer highlight a sense of emergency in solving a problem, rather than understanding the root cause and development of a sustainability pattern for avoiding reoccurrence.

The Process of Innovation Creation

Successful corporate spend significant time in identifying ideas and converting them in to commercially viable products or processes [7]. It is estimated that to achieve one commercial success of a product in the USA, 3000 raw ideas are required and 1 of 3 launched products do not succeed despite rigorous research and planning and an astonishing 46% of all resources spent of new products never take off at the market or deemed to be failure [8-10]. In Europe, over 76% of new products never reached their marketing lifecycle at the end of its first year (Source: Nielsen Breakthrough Innovation report 2014) The formulation of product failure often relates to failure in understanding needs of the consumers and in some occasions solving problems which do not exist [11]. Fraunhofer's model to tackle issues of preventing product failures is closely linked to careful analysis of market data and the propensity of the process or product to adopt and resist. In addition to market analytics, enhancing internal capabilities within the team facilitates the execution techniques of the process [12]. Often, the success of the innovation strategy depends on the capabilities of the organisation [13]. An organisation similar to Fraunhofer stays successful despite the product failure rates due to the innovate strategy being inherited within the skill set of its huge workforce. The strategy to sustain capabilities with an organization demands scientific competence, professional networking and a well-established financial mix [14]. In this context, any new product or process developed at Fraunhofer is guaranteed to sustain the failure rates and succeed in the market.

The Innovation Process "Internationalization Case-Study"

The main objective of this defined case was to provide an Internationalization strategy for technologies which can be termed as redundant or saturated in the European context. The project involved in adapting older / unused technology to new social, political, geographical and economic environment benefiting the end user and the technology provider by creating new jobs and facilitating developing economies in South-East Asia. The challenge however was the localization of technology and analyzing technical problems that may occur and providing appropriate solutions for possible issues [15].Technologies developed in Europe have a protection of intellectual property and most of the technologies have a patented framework. The risk for European companies entering in a new market despite the volume of end-users is deemed to be high due to the fact of copyright issues. Several corporations have suffered losses due to this uncontrolled mechanism of copyright protection. Technology companies required a European validated quality assurance handling technology localization in Asia. The companies wanted to make decisions on technical, legal and HR issues in Europe rather than hiring consultants in the target region. The project required a Technology Adaptation Management (TAM) team and the Team modulated a highly Innovative Technology Logic Model acting as a software enabler to minimize financial risks and support decision making for businesses in Asia.

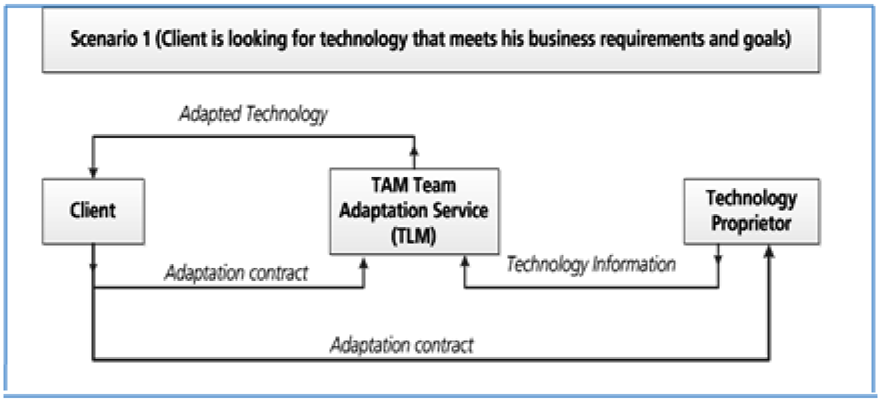

Scenario 1 (Client is looking for technology that meets his business requirements and goals)
Adapted Technology
Client
TAM Team Adaptation Service (TLM)
Technology Proprietor
Adaptation contract
Technology Information
Adaptation contract

Fig 1: The innovation behind TAM for Technology acquisition

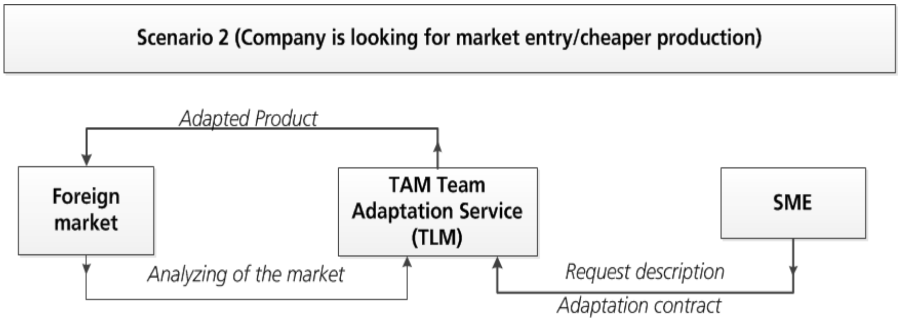

Scenario 2 (Company is looking for market entry/cheaper production)
Adapted Product
Foreign market
TAM Team Adaptation Service (TLM)
SME
Analyzing of the market
Request description
Adaptation contract

Fig 2. The Innovation behind TAM for Market entry or Production facilities

There are several external and internal factors leading in this Innovation chain namely Cultural management of staff involved, technical skills with acute business knowledge, understanding of local law, new service models and last not but least pro-active leadership [16]. As an organization does not rely only on its skilled workforce and motivation from its employees but also it is dependent on its senior leaders and the decisions they make [17]. It is well known that every leader in an organization has an agenda, the intent to perform and the intention often does not fit in the original plan of the organization or the project [18]. The current trend of leadership and management models especially in public bodies are mainly based on hierarchy and fear inflicting strategy. Protectionism plays a significant role in public body leadership. Innovation, focus, inspiration, originality and trust are seldom used in current leadership in public institutions as leaders are busy with creating, modifying, ratifying rules and regulations according to a political aspect and agenda or for personal gain. The absolute guarantee of protecting his/her own job slows down the progress as risks and challenges are ambiguously defined in current leadership. A typical International project where several international partners use different kinds of languages, customs, traditions, values and styles to run operations, strategy and decisions are often a challenge not only for it is team members but also it is leadership. The management mantra is difficult to formulate due to this extraordinary diversity. Several leading institutions including MIT, Fraunhofer etc. have an advantage of starting up operations in a well-known geography and political setup and they often succeed because of starting operations in a “known” environment [19]. Internationalization is multifold and a complex strategy, in terms of management and governance. Laws and rules have to be rectified to accommodate the project. Partnerships have to be established overcoming political and geographical boundaries. The leader who is willing to take risks, challenges, using common sense and logic, keeping an eye at the horizonwill succeeds [20, 21].

2. OBSTACLES IN INNOVATION

It is not the process and tools which hinder innovation but leadership in the organization often is the reason for failure [22]. Often leaders spent time in talking, rather not acting and leaders in innovative organizations are often rewarded or assessed on their operational KPI’s rather than Innovation Excellence [22]. In governmental organizations, leaders often spend time in creating roadmaps and strategy documents that can be measured and monitored for governance. The governance structure is based on a business phenomenon and notfocused on efficient operation methods. There are several external and internal barriers in project innovation journey and some of them are listed below in the Table.1

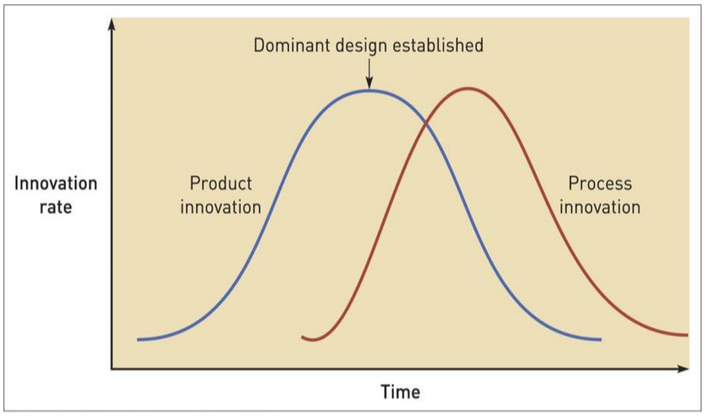
Internal Obstacles	External Obstacles
Despite the process guarantee on quality assurance, the leadership is often not based on outcome-oriented functioning	The focal point remains in providing a good visibility of the organization and a lot of resource spent. Whereas the resource could be of significant use in internal functioning
A lot of emphasis is placed in Infrastructure maintenance and less focus on personality development	While implementation and development are performed by local teams, there is less emphasis in mobilizing teams for external development
An artificial external cooperation window but in reality, every single cooperation must be reported to the Director.	No long-termstrategy on external cooperation. Often external strategies are based on preferences on leaders.
There is no common spirit of commitment with	Decisions of external infrastructure development are often not consulted with local operation teams or

technical, operational and leadership staff.	partners.
In-consistent and in-efficient decision making	Disregarding partner or any partnership agreement based.
No assurance of international competitiveness as local staff at Public organizations are seldom sent abroad for coaching	Leaders often do the travelling and strategies meetings without the key members of staff and strategies are misleading due to improper communication.
No mechanism to motivate performing staff	Leaders get promoted very often

Innovation Risks Involved and Contingency Plans

Risks Involved	Contingency Plans
Delayed implementation of the main strategy and the quality management because of long lasting discussion processes within the leadership (more talking and less action).	Problems and different expectations have to be discussed in advance. The discussion process must be founded on a collection of data from every member of the team. A time frame has to be set and respected.
The leaders deliver late or not deviating from decisions that were made	Mechanisms assuring the regular delivery of decision have to be part of the quality management strategy
The leaders misinterpret the supporting and advisory role of the administration in assumption that administration must comply to all management decisions at the earliest	Administration is an important component within the management and the management needs to respect that and provide feasible timeline for administration to perform their duties
The leaders do not react quickly enough on the results of the internal and external evaluations**.**	At the end of each evaluation must be established a plan with follow-up measures including time frames, awards for quick and sanctions for delayed implementation. The success can be controlled either by a steering committee or an external agency.
Difficulties may appear in the practice of governance due to regular leadership change	Minimize staff attrition by providing incentive based pay rather than public scaling methods.
Reasonable involvement of the partners into the structure without decelerating the decision-making process The project team may not be satisfied with the centralized allocation of resources.	A strong mechanism to include partners will be inherited in the project operational model. The allocation of resources has to follow transparent criteria like evaluations results, outcome-figures, and potentials of the partners, prospective gain or future-orientation.
Difficulties may appear in the practice of governance.	Precise and flexible regulations must be integrated

PRODUCT AND PROCESS INNOVATION



Product and process innovation

Source: Adapted from J. Abernathy and W. Utterback, 'A dynamic model of process and product innovation', *Omega*, vol. 3, no. 6 (1975), pp. 142–60

Fig3: Product and Process Innovation (Source: by Abernathy and Utterback)

According to Abernathy and Utterbocks model, leaders often face an uncertain, exploratory phase in the initial phases and the more flexible they stick on their task, the more dominant they become [23].Organization's leadership is closely linked to Transactional leadership as product innovation often ends in standardization and integration and there is less exhibition of innovation whereas process innovation is also linked to standardization but there is an exhibition of performance with flexibility in integration [24].

The leaders in the organization are very reluctant to use outside expertise and despite the network established in the international domain, some leaders still depend on what the team knows internally. In public organizations, there is a trend to agree rather than collaborating and challenging and in cases to tap the network. Leaders often decide in how ideas fit rather than how do they differ, and innovation is often deemed to be managed rather than cultivated.

3. KEY FINDINGS

The preliminary research highlighted in this article Show cases the excellence of research organizations like Fraunhofer in a commercially viable platform, for a sustained period of time. This has been achieved with different factors like:

1) Freedom of implementation
2) Infrastructure enhancement
3) Researchers motivation
4) Personal and institutional profiting through salaries, grants and contracts
5) Culture of organization and its associated value stream
6) Known location of organization
7) Research and Development capacity
8) Public institutional support

Despite the organization being world class and esteemed highly with business leaders, there are obstacles in the innovation journey namely:

1) The complexity of change management
2) Dependence in Innovation strategy which is built in-house.
3) Taking minimized risks and highlighting no reason to protect IP due to the complexity of the job.
4) Minimal signs of business models encouraging partnership
5) very minimal knowledge of mutual value creation
6) target's based on roadmaps with no measuring index
7) Execution based on traditional methods
8) Entering the market first rather than careful entry with a long-term strategy.

In addition to all those open and closed innovation issues, branding of public institution is often difficult due to the fact that the private industries experience in dealing with public organizations regulations are an adversary with regulatory matters. There is a significant barrier to communication and commercialization as partnership often involves a diverse set of partners including bank, private industries, clusters and international partners. The very nature of business especially in research development context is very global and teams without cultural understanding and adoption to cultural differences will eventually fail to sustain the market. It was identified that 3000 raw ideas are required to generate one successful business case and often the failure cases do not adapt to cultural changes. Fraunhofer has succeeded beyond these failures rates due to the fact of valuing the peer to peer innovation and monetise ideas which showed significant disruptive capabilities. There are still different obstacles in the innovation chain which are currently being addressed and the potential list of them is listed below:

1) Fostering new networks of the organization with communities in unknown geography to diversify the knowledge bank to develop new technology products?
2) Creating business models that diverge from a closed model of internal development costs to market revenue to an open model of licensing and creating new revenues through spin-off and leveraging external development.
3) Integrating commercial value in fundamental research development and maximising economic gain.
4) While innovation currently is managed by senior leadership, there are ways to cultivate innovation with new skill development and mobilising staff internally within the organization and with external partners globally.
5) Performance related pays are not currently focussed on creativity and passion while innovation is all about creating small steps of new but integrated management process with creative solutions.
6) Identifying like-minded individuals remain as a big barrier for innovation and providing incentives for loyal employees.
7) Operational management in running new systems has its own advantages while promoting new systems are critical for innovation, running older systems in parallel will enable learning from comparisons.

4. CONCLUSION

Technology development and Globalization are true facilitators for innovations. The change in organizational and leadership management is exponentially accelerating due to globalisation and high-speed communication. Mobility of people is a vital resource where skills are transformed and shared creating a value for the society. The author has identified some important recommendations for the senior management but the scope of this is not limited to leadership.

1. The universities and research organizations in Europe must aim in delivering knowledge-based research which can be applied in a commercially viable solution aiming at the society.
2. The companies in the innovative front should promote teams to develop management processes that can be easily integrated into existing management principles or strategy to minimise resource duplication or environmental issues related to developing new solutions
3. The organizations that are not innovation led often tend to focus innovation in one single department or unit instead of concentrating the innovative models across the value chain of education, research, business creation, mobility, leadership and management.
4. Organizations need to establish monitoring mechanisms for current innovation patterns world-wide and future predictions by developing tools with appropriate market analytics. This enables in minimizing risks of industries entering new markets or identifying similar products within the same context of development.
5. Organizations which recruit local expertise cannot sustain the global challenges of internationalization. In order to sustain the innovation growth, a mechanism to recruit and train diverse talent groups would be a triumph card for the future.
6. Involvement of customers in product development inherits a open innovation context of thinking and understanding needs in early stages of development can minimize resources and maximize profits
7. Provide research results leading to new industrial technologies that significantly strengthens European innovation policies
8. Organizations promoting cross-sectorial collaboration often creates value-added products and they naturally promote innovation within their portfolio.
9. Companies need to establish a centre of excellence within their corporate strategy in training and managing young but creative employees to exploit their ideas in different fields of engineering and technologies.
10. Promote information sharing against return of gaining value and entering contracts with partners and create mechanism to share revenue for value added partnership
11. Promoting transformation of ideas into something useful for society or business.
12. Create entrepreneurshipwithin organizations.
13. Minimizing staff attrition is vital for stable growth and successful implementation of innovation.
14. Creating transparent methodologies for communication from/to the senior management
15. Promote open technology platforms for sharing information and steam-lining communication methods.
16. Promoting leaders to take risk, challenges which will not comprise their contractual obligations, using common-sense and logical interpretation with appropriate data to solve problems.

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